Chippewa River Bridge
Spanning the Chippewa River on State Highway 35
Nelson Vicinity
Buffalo County
Wisconsin

HAER No. WI-69

HAER
WIS
6-NELS.V,
1-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Rocky Mountain Regional Office
P.O. Box 25287
Denver, Colorado 80225

HAER NO. WI-69

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HISTORIC AMERICAN ENGINEERING RECORD

CHIPPEWA RIVER BRIDGE

Location: STH 35 over the Chippewa River
Vicinity of Nelson, Buffalo County, Wisconsin

The west side of the bridge is in the Pepin Vicinity in Pepin County, Wisconsin

USGS Wabasha North Quadrangle, Universal Transverse Mercator Coordinates:
Zone 15 Easting 573630 Northing 4920610

Present Owner: State of Wisconsin

Present Use: Vehicular bridge

Significance: The Chippewa River Bridge is a seven-span, Parker truss. It was erected in 1933. According to Cultural Resource Management in Wisconsin, there were thirty-six Parker overhead trusses remaining in Wisconsin as of September 1983.[1] Many have been subsequently removed, thereby increasing the value of those twenty-four Parker trusses (including the Chippewa River Bridge) that remain. With its polygonal top chord, riveted connections and State Highway Commission design, the Chippewa River Bridge is locally significant as a good example of the Parker truss type. Further, with its seven spans, the Bridge has statewide significance as the longest (1,242 feet), multiple span (seven) Parker truss in Wisconsin.

PART I. HISTORICAL INFORMATION

A. Physical History:

1. Date of erection: 1933[2]
2. Architect: State Highway Commission of Wisconsin[3]
3. Original and subsequent owners: Public ownership

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[1]Barbara Wyatt, ed., Cultural Resource Management in Wisconsin vol. 2 (Madison: State Historical Society of Wisconsin, Historic Preservation Division, 1986), Transportation 12/6, 15, 16.

[2]The Pepin Herald, 9 November 1933; Buffalo County Journal, 18 May; 27 July; 17, 24 August; 28 September; 19 October 1933.

[3]Bridge Plans, Xerox copy in possession of Westbrook Associated Engineers, Spring Green, WI.

4. Builders, suppliers:

A. Builders: Worden-Allen Company[4]

B. Suppliers: Unknown

5. Alterations and additions: None

B. Historical Context:

TRUSS BRIDGE DESIGN: GENERAL

There are three essential aspects of a truss. First, a truss is a combination of relatively small members which are "framed or jointed ... to act as a beam."[5] Second, each component member is subjected only to tension or compression. (Tensile forces tend to stretch or elongate a member while compressive forces tend to push or compress a member.) Third, the component members of the truss are configured in triangles because "the triangle is the only geometrical figure in which the form is changed only by changing the lengths of the sides."[6] In other words, the triangle remains rigid until the forces applied distort or break the material used in the components.[7]

A truss bridge consists of two trusses, each with a top chord, bottom chord and endposts. The space enclosed by these members is called the web. The web members reinforce the truss. The particular arrangement of the web members was the subject of much study in the mid-and late-nineteenth century, and different names were given to trusses with different web configurations. The two most popular types of trusses in Wisconsin were the Pratt and Warren.

Truss bridges are generally divided into three categories: pony or low trusses, overhead or through trusses, and deck trusses.[8] Both pony and

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[4]The Pepin Herald, 9 November 1933; Buffalo County Journal, 18 May 1933.

[5]J.B. Johnson, C.W. Bryan and F.B. Turneaure, The Theory and Practice of Modern Framed Structures 8th ed. (New York: John Wiley & Sons, 1905), 3. In other words, the "assemblage had rigidity and behaved as a unit." Ellis L. Armstrong, History of Public Works in the United States, 1776-1976 (Chicago: American Public Works Association, 1976), 109.

[6]Milo S. Ketchum, Design of Highway Bridges and the Calculation of Stresses in Bridge Trusses (New York: Engineering News Publishing Company, 1908), 1.

[7]A rectangle, on the other hand, can become a parallelogram as everyone with a sagging screen door knows. The common solution to the sagging door is to run a small rod diagonally across it, thus creating two triangles. The resulting figure looks remarkably like one panel of a 19th century Pratt truss.

[8]T. Allan Comp and Donald Jackson, "Bridge Truss Types: A Guide to Dating and Identifying," American Association for State and Local History Technical Leaflet 95, in History News 32 (May 1977) 5, 6-7. Ketchum, Design of Highway Bridges, 5-11.

overhead trusses carry the traffic between the trusses, and the roadway is at or near the bottom chord of the trusses. A deck truss carries the roadway at or near the top chord; thus, the roadway is on top of the trusses.

TRUSS BRIDGES IN WISCONSIN

On Wisconsin highways, the predominance of metal-truss bridges for crossings of all lengths seems to have lasted from about 1890 to 1910. Trusses remained an important bridge type in Wisconsin until the advent of World War II, but after 1910, most short crossings (less than 35 feet) employed girder, beam or slab spans of steel and/or concrete. The Wisconsin State Highway Commission (SHC), established in 1911 to improve the quality of road and bridge construction in the state, was particularly enthusiastic about using concrete for culverts and small bridges.[9]

The two truss designs that came to dominate highway bridge construction by the late-nineteenth century were the Warren and the Pratt. The Warren truss was patented by two British engineers in 1840. In this design, the vertical members handle only nominal stress, while the diagonals serve as both tension and compression members. The vertical members, like the diagonals, were usually paired angles, but of smaller dimension. In Wisconsin, Warren trusses are by far the most common type of highway truss, having been promoted by the SHC after 1911. Of the approximately 450 Warren trusses in Wisconsin in 1980, over four-fifths were riveted pony trusses built according to SHC standard plans.[10]

The Pratt truss, patented by Caleb and Thomas Pratt in 1844, features vertical compression members and diagonal tension members. Although originally built as a combination bridge, however, the Pratt had the advantage because it used less iron and was easier to erect. The oldest existing truss bridge in Wisconsin, the 1877 White River Bridge in Burlington, is a Pratt.[11]

During the 1870s, an important variation of the Pratt design was introduced for long span bridges. Because the depth of truss required in the center of

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[9]Hans Nelson Brue, "The Development of Highway Bridges in Wisconsin," Bachelors Thesis in Civil Engineering, University of Wisconsin, 1916, 4-5. The historical record is sketchy here, and there is no reliable census of bridges by type for this period. The 1880s and 1890s saw a large number of metal trusses built, often with some controversy over the higher first cost when compared to the familiar old wooden bridge. It was not just a phenomenon of the late-nineteenth century. Simple wood beam, beam and pier, and truss bridges were recommended for the cost-conscious land owner in Frederick S. Langa's "Bridge Your Way to a Low-Cost Lot," Rodale's New Shelter, April 1981, 66-75.

[10]Comp and Jackson, "Bridge Truss Types;" Working Files, HBAC, Wisconsin Department of Transportation, Madison, WI.

[11]Comp and Jackson, "Bridge Truss Types." A few small Howe trusses were built, including, apparently, one built in Watertown in 1875. Diane Kromm, "Milford Bridge," Historic American Engineering Record Report, unprocessed, 1987, HAER No. WI-37.

a bridge is greater than at the abutments, a considerable amount of material can be saved on a long span structure by "bending" the top chord into a polygonal configuration. This creates a "Parker" truss. If the top chord has exactly five sides, the bridge, by convention, is called a "camelback" truss. The addition of substruts and/or subties makes a Pratt into a Baltimore and a Parker into a Pennsylvania.[12]

There were thirty-six extant Parker bridges in Wisconsin in 1982, all of which were divided between three groups: pin-connections with built-up members, riveted connections with built-up members and riveted connections with rolled members. The only pin-connected Parker identified was a 1908 structure built by the Hennepin Bridge Company. It was replaced in 1983. Of the thirty-five Parkers remaining, seventeen had riveted connections and built-up members.

The development of the Pratt and its variations was influenced by a debate over the merits of pin connections versus riveted connections for main truss members. Proponents of riveted bridges usually cited the advantages of increased structural rigidity and the reduction of damaging vibrations. In pin-connected bridges, vibrations caused the pin to grind on the eye-bar, thus enlarging the pin hole. Advocates of pin-connected bridges, on the other hand, emphasized the theoretically correct distribution of stresses and the smaller amount of metal required. They also criticized the difficulty of ensuring that a riveted joint was properly fabricated, especially in the field. The pin-connected bridge, they argued, was the reason why Americans surpassed the rest of the world in bridge building.[13]

The issue of pin versus riveted connections was complicated by practical factors including machinery, tools and power sources, both in the shop and in the field. The debate also was easily sidetracked by tangential issues, as for example, when some commentators denied that the pin per se, was the most important feature of "characteristically American" bridgework. In addition, both connection types came to incorporate features that were not an intrinsic part of the design. Many early riveted spans, for example, used the lattice girder (or multiple triangulation design), which was clearly excessive in material, while many pin-connected bridges were dangerously light, particularly in their details. Thus, a fair comparison between the two

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[12]Comp and Jackson, "Bridge Truss Types," 5-7. See also J.A.L. Waddell, Bridge Engineering (New York: John Wiley, 1921), 176, 177; Johnson, Bryan and Turneaure, Modern Framed Structures, 275; Ketchum, Design of Highway Bridges, 212; Henry G. Tyrrell, History of Bridge Engineering (Chicago: 1911), 184-192.

[13]J.A.L. Waddell, Economics of Bridgework: A Sequel to Bridge Engineering (1921), 73-74; Alfred P. Boller, Practical Treatise on the Construction of Iron Highway Bridges 4th ed (New York: John Wiley & Sons, 1890), 44-49; "Discussion of American Railroad Bridges," American Society of Civil Engineers, Transactions 26:429 (December 1889): 593. According to Boller (p. 47), "Whatever objection has been urged against shop-riveting is intensified in a high degree when the field-riveter steps in to do his part of the work." For an argument that pin-connected Pratt trusses require more metal than riveted Warren trusses, see Johnson, et. al., Modern Framed Structures, 276.

systems was not always made.[14]

According to J.A.L. Waddell, the controversy raged in engineering circles for a dozen years around the turn of the century. No dramatic resolution of the issue occurred, but "time and steady development of the real science of bridge designing" gradually changed minds. Significant changes in riveting technology also altered the terms of the debate.[15] A compromise of sorts was finally reached, resulting in the adoption of the best features of each design. Riveted bridges were designed with less duplication of members, while pin-connected bridges, suitably detailed, were still accepted for long span highway bridges.[16]

In Wisconsin, SHC officials clearly favored riveted construction from an early date. Consequently, the distinction between pin connections and riveted connections establishes an important subcategory boundary, separating the era of state-planned bridges from the preceding period in which bridge companies were largely responsible for bridge design. As early as 1908, state engineers advocated the use of riveted pony trusses for short-span bridges.[17] When the SHC was formally established in 1911, the riveted Warren became the state's standard pony design. In that year, the SHC also drafted a standard plan for riveted, overhead, Pratt trusses, and by 1914, the agency had adopted riveted construction for all overhead Pratt variations. As SHC engineer A.R. Hirst wrote in 1913, "Very seldom do we use a pin-connected truss...."[18]

In the mid-1930s, the SHC seems to have developed a preference for overhead Warren trusses for long-span bridges, although some overhead Pratts continued to be built. Riveting remained dominant in bridge building until well after World War II. As late as 1931, the construction specifica-

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[14]Waddell, Economics of Bridgework, 7; "The Development of Bridge Trusses," Engineering Record 42 (3 November 1900): 411.

[15]Charles Evans Fowler, "Some American Bridge Shop Methods," Cassier's Magazine 17 (January 1900): 200-215, 327-344; Charles Evans Fowler, "Machinery in Bridge Erection," Cassier's Magazine 17 (February 1900): 327-344; "Pneumatic Percussion Riveters," Engineering News 39 (3 March 1898): 148-149; "Field Riveting by Power," Engineering News 42 (27 October 1900): 385; "Pneumatic Field Riveting in Railway Bridgework," Engineering News 42 (27 October 1900): 393-394.

[16]Waddell, Economics of Bridgework, 74; "Development of Bridge Trusses," 411.

[17]See, for example, the photograph of "a riveted steel [Pratt pony truss] highway bridge 40 foot span...built under the supervision of the Highway Division" in Arthur H. Hirst and M. W. Torkelson, Culverts and Bridges (Madison: Highway Division, Wisconsin Geological and Natural History Survey, Road Pamphlet No. 4, second edition, 1908), 43. The SHC standard plan (dated 1908) for a riveted Warren pony truss with a 40 foot span is found in Microfilm Reel M-1, "Miscellaneous Standards," Bridge Section, WisDOT.

[18]A.R. Hirst, "Bridges and Culverts for Country Roads," Engineering News (9 October 1913): 729. With minor modifications, these standards are reiterated in Wisconsin State Highway Commission, Second Biennial Report, July 1, 1911 to January 1, 1915 (Madison: 1915), 24.

tion of the American Association of State Highway Officials (AASHO) stated, "welding of steel shall not be done except to remedy minor defects and then only with the approval of the engineer." Shortly after the war, however, riveting rapidly disappeared, replaced by welding and high strength bolts.[19]

[The Chippewa River Bridge is a Parker Truss with riveted connections.]

THE STATE HIGHWAY COMMISSION (SHC)

The involvement of local governments in bridge repair, replacement, and construction projects was the subject of numerous laws in the late-nineteenth century. With the Good Roads Movement of the late 1890s and early 1900s, a specific set of proposals was put forth for greater involvement by the State government in promoting good quality bridges.[20]

In 1907, the state legislature established a Highway Division within the Wisconsin Geological and Natural History Survey to conduct experiments in road design and to advise local governments about specific projects. Town governments, traditionally reluctant to hire an independent engineer to assist in bridge building, could now avail themselves of free engineering counsel from the state. At the same time, the legislature required counties to make a commitment to professional oversight and increased funding by appointing "a competent engineer or experienced road builder" to serve as County Highway Commissioner.[21]

In 1908, Wisconsin voters removed the greatest obstacle to creating a progressive statewide system of bridge and highway construction. In that year, by a three-to-one margin, they eliminated the state's constitutional prohibition against direct state aid to transportation projects. When the Legislature made its first appropriation for highway improvements in 1911, it also transformed the Highway Division of the Geological Survey into the autonomous State Highway Commission (SHC), which was given the responsibility of overseeing the expenditure of state funds for the

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[19]U.S. Department of Transportation, Federal Highway Administration, "Design and Construction of Welded Bridge Members and Connection," Washington, D.C., 1980: 1, 6-9.

[20]Ballard Campbell, "The Good Roads Movement in Wisconsin, 1890-1911," Wisconsin Magazine of History 49 (Summer 1966): 273-93; M.C. Davis, ed., A History of Wisconsin Highway Development, 1825-1945 (Madison: State Highway Commission, 1947), 218-222; Wisconsin Statutes, Second Session of the Legislature, 10 January 1849 (Southport: 1849), 182-183; Town Laws of Wisconsin, 1858, 157; Legislature of Wisconsin, Private and Local Laws, 1867, 60-61, 179-182; Laws of Wisconsin, 1881, Chapter 315 (Madison: 1881), 407-408; Laws of Wisconsin, 1885, Chapter 187 (Madison: 1885), 162-164; Richard N. Current, The History of Wisconsin: Volume 2, The Civil War Era, 1848-1873 (Madison: State Historical Society of Wisconsin, 1976), 28; Robert Nesbit, Wisconsin, A History (Madison: University of Wisconsin Press, 1973), 197. A sampling of available county board records suggests that county-aid bridge projects were infrequent during the 1880s, and numbered five to ten per county per year during the 1890s.

[21]Campbell, "Good Roads," 278-79; Laws of Wisconsin, 1907, Chapter 552 (Madison: 1907), 292.

development of a state highway network.[22]

Similar to the former Highway Division, the SHC emphasized the use of standardized plans for various types of bridges and culverts.[23] The first set of standardized truss plans encompassed spans ranging from 36 to 128 feet, generally in five-foot increments. All but one had a sixteen-foot roadway. Revised several times by the 1920s, these plans gradually provided for wider bridges, and continually incorporated the latest engineering wisdom and detailing.[24]

In the first three and one-half years of its work, the SHC designed over 1,500 bridges of all types. All were designed to carry a live load of fifteen tons. Believing firmly in the use of reinforced concrete to "the fullest extent practical," the SHC was pleased that all but three of their designs had concrete floors. These figures included almost 900 bridges requested by local governments in seventy counties. Practically all the local bridges in the state during these years were either designed by the SHC or were based on SHC standard plans.[25]

Despite its enthusiastic support for concrete construction, the SHC declared in 1926 that the steel bridge "is not looked upon with disfavor," and it continued to refine its truss designs. In the late 1930s, it made a major commitment to keeping its standardized plans up to date by dropping the Pratt design in favor of the Warren all overhead truss configurations. Newly completed SHC designed truss bridges, both monumental and modest, also continued to be featured in the photographic sections of the agency's biennial reports. Nevertheless, the SHC clearly favored concrete spans, citing advantages of lower cost, greater compatibility with aesthetic treatment and greater adaptability to remodeling, especially in terms of roadway widening.[26] The metal truss, however, remained cost effective in many situations, and the SHC continued to design some truss bridges until well after World War II.

[The Chippewa River Bridge is a State Highway Commission-designed bridge.]

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[22]Campbell, "Good Roads," 279-84; Davis, Wisconsin Highway Development, 104.

[23]WHC, Second Biennial Report, 24.

[24]Microfilm Reel M-1, Bridge Section, WisDOT.

[25]Davis, Wisconsin Highway Development, 112-13; SHC, Second Biennial Report, 21, 14, 30; see also SHC, Preliminary Biennial Report, July 1, 1911 to January 1, 1913 (Madison, 1913), 17.

[26]The SHC succinctly assessed the pros and cons of steel and concrete bridges in its Sixth Biennial Report, 1925-1926 (Madison, 1926), 67. From 1911 to 1915, truss bridges in Wisconsin cost considerably less per foot than concrete structures, but then steel began its "great advance in price." See SHC, Fourth Biennial Report, 1916-1918 (Madison, 1918), 11-12; see also the comparative cost chart in Engineering News 47 (28 February 1917).

WORDEN-ALLEN COMPANY

[The SHC designed bridges; it did not actually fabricate them. That work was contracted out -- in this case to the Worden-Allen Company.]

The Worden-Allen Company was founded shortly after the turn of the century while Beverly L. Worden was still construction engineer for Wisconsin Bridge and Iron.[27] The firm may have been more Worden than Allen as Clarence J. Allen appears to have been associated with the company as secretary-treasurer from the founding only until 1907. Although the name always remained Worden-Allen, Beverly Worden by far achieved more prominence.[28]

Beverly Worden worked in the Milwaukee Public Library before becoming an engineer. Presumably, he was an apprentice engineer at Wisconsin Bridge and Iron Company before he sought and received a degree in civil engineering from the University of Wisconsin in 1893.[29] After getting his degree, he listed himself first as a civil engineer, then, in 1895, as a bridge engineer, and then, from 1896 to 1902, as a contracting or construction engineer.[30] The latter term may refer to a superintendent position with the Wisconsin Bridge and Iron Company.[31]

The Worden-Allen Company was formally incorporated in December 1902. It soon became one of the largest twentieth-century bridge companies in the Midwest and in 1915 had offices in Chicago, Milwaukee, Buffalo, New York City and Houghton, Michigan. In 1911, the firm had a structural steel

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[27]At least two sources give the date of founding as 1901. Who's Who in America (New Province, NJ: Reed Puhlishing), 2416; Wisconsin: Stahility, Progress, Beauty vol 3 (Chicago: The Lewis Publishing Company, 1946), 134. The company did not advertise until 1903. Milwaukee City Directory, 1903 (Milwaukee: Wright Directory Company, 1903), 1270, 1321. Note that the Wright Directory Company has also been known as A.G. Wright and H.C. Wright, although the "Wright Directory Company" is used throughout this report.

[28]Milwaukee City Directory, 1907 (Milwaukee: Wright Directory Company, 1907), 108, lists only Allen's home address. No affiliation with the company is given. Perhaps, Mr. Allen provided the original capital and Mr. Worden the engineering expertise.

[29]Beverly Worden is listed as an engineer in 1889 and a student in 1892. Milwaukee City Directory 1889 (Milwaukee: Wright Directory Company, 1889), 881; Milwaukee City Directory, 1892 (Milwaukee: Wright Directory Company, 1992), 1001. Sheets 1 and 2 of the plans for the Hewitt Street Bridge, Neillsville, Clark County, huilt hy Wisconsin Bridge and Iron in 1892, were checked hy "Worden." Sheet 3 was made hy "Worden." Copies in possession of the authors Hess & Frame. The information on the University degree is in Wisconsin: Stahility, 134.

[30]Milwaukee City Directory, 1893-1894 (Milwaukee: Wright Directory Company, 1894), 1076, 1099. Worden first lists his association with Wisconsin Bridge and Iron in 1900, hut he gives the same husiness address as early as 1897. Milwaukee City Directory, 1897 (Milwaukee: Wright Directory Company, 1897), 1022; Milwaukee City Directory, 1900 (Milwaukee: Wright Directory Company, 1900), 1141.

[31]Obituary, Milwaukee Journal, 28 March 1931, in Wisconsin Necrology, vol. 29, p. 153.

capacity of 12,000 to 15,000 tons per year and grossed over one million dollars annually.[32]

Worden-Allen built a number of Warren pony trusses based on the standardized plans of the State Highway Commission. The company also built the first known riveted Pratt overhead truss in Wisconsin in 1909. This was a design which the SHC advocated in its 1912 set standard plans.[33]

1909 was also the year in which Worden organized a subsidiary bridge company, the Lackawanna Bridge Company, with offices in Milwaukee, Buffalo and New York. In 1921, Lackawanna also advertised itself as "General Contractors For Fireproof Construction."[34] In the years before World War I, Worden apparently commuted between Milwaukee and the East.[35] The Worden-Allen Company continued to build bridges in Wisconsin at least as late as 1933, although it did not dissolve until 30 December 1977.[36]

During World War I, Worden was called upon by the government to assist in the war effort. As general manager of the Newark Bay Shipyard in Newark, New Jersey, he oversaw the completion of 150 ships for the Emergency Fleet Corporation. He is said to have "turned the preconceived ideas of shipbuilding topsyturvy." His contribution apparently involved standardized plans and construction techniques. After the war, Worden became president of Cutler-Hammer, Inc. of New York and Milwaukee, the "foremost business of its kind in the field of electrical controls." He was also a director of Buffalo Sand and Gravel Company.[37]

HISTORIC BRIDGE ADVISORY COMMITTEE (HBAC)

The systematic study of Wisconsin truss bridges began in 1976. Under the sponsorship of the State Historic Preservation Office (SHPO) of the State

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[32]George Danko, "A Selective Survey of Metal Truss Bridges in Wisconsin" (Madison: State Historical Society of Wisconsin, Historic Preservation Division, [1977]), 25.

[33]For a discussion of the SHC standard plans, see the section on Design and Engineering. The riveted Pratt is on Wagon Trail Road in Pierce County, B-47-006.

[34]Danko, "A Selective Survey," 25; "Market Place," Engineering News-Record 86:26 (30 June 1921): 126.

[35]Wisconsin: Stability, 134; Obituary, Milwaukee Journal.

[36]The contract for the Wrightstown Bridge, Job No. 3391, was awarded to the Worden-Allen Company for $158,290.59 on 14 November 1933. Wisconsin State Highway Commission, Minutes, vol. 18 (14 November 1933), 315; Secretary of State, Records..

[37]Wisconsin: Stability, 134; Obituary, Milwaukee Journal. According to this latter source, Worden's shipbuilding firm was "known as the Submarine Boat Co." and was at one point "40 days ahead of schedule in building ships to check the manace [sic] of German submarine warfare."

Historical Society, George M. Danko created a preliminary truss bridge design and construction context. As well, focusing on counties he hypothesized would have both a high concentration of truss bridges and high replacement demands, Danko conducted an intensive field survey of truss bridges in eleven counties.[38]

By 1980, when WisDOT established the Historic Bridge Advisory Committee (HBAC), seventeen bridges had been listed on, or found eligible for, the National Register of Historic Places. However, neither Danko's studies nor the individual nominations and determinations of eligibility provided a fully developed statewide historical and chronological context for evaluating truss bridges. The goal for the HBAC, consequently, was to create a statewide inventory that would expedite the evaluation of truss bridges, which, in 1980, accounted for approximately one-tenth of the state's 10,386 surviving highway bridges built before 1950.

The HBAC was guided by the basic assumption that all distinctive types of truss bridges merit some degree of preservation. A review of WisDOT Bridge Section resources identified an initial pool of 996, pre-1941 bridges that represented 18 truss types.[39] Those bridges were then studied to identify which had the earliest known construction dates, were in the best condition, had the best available historical data (e.g. bridge plates, SHPO research files, previous historical studies), and had the most obvious noteworthy features (e.g. longest span, greatest number of spans, unusual workmanship). This winnowing reduced the initial pool by approximately 75 percent.

To determine the most significant bridges within each truss category, a set of evaluation criteria, with a corresponding numerical rating system, was developed from the model developed by Virginia.[40] A trial run was conducted on the bedstead-truss (truss-leg) category. Because this category consisted of only eight examples, it was possible to rate all examples and compare the results with a "subjective" analysis of the entire group. The criteria were revised in light of this experience and then applied to each category with more than a dozen examples. Evaluations included a field review of the structure, and, when time permitted, limited historical research.

The HBAC evaluation process yielded a final group of fifty-three bridges deemed potentially eligible for the National Register. A thematic determina-

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[38]George M. Danko, "The Development of the Truss Bridge, 1820-1930, with a Focus Toward Wisconsin," unpublished report prepared for the State Historic Preservation Office, State Historical Society of Wisconsin, 1976; Danko, "A Selective Survey."

[39]Originally, Pratt Pony trusses with a single vertical member were considered to be a separate category, but this distinction was subsequently dropped and the number of categories was reduced to seventeen.

[40]Howard Newlon, Jr., "A Trial Rating System for Bridges," Interim Report No. 1, Criteria for Presentation and Adaptive Use of Historic Highway Structures (Richmond?: Virginia Highway and Transportation Research Council, n.d.), 78-R29.

tion of eligibility, however, was not completed, and some attrition occurred. In 1986, WisDOT re-evaluated the remaining bridges, selected "next-best" substitutes for those that had been replaced and initiated an intensive survey to document authoritatively the National Register eligibility of the sample. The field survey of fifty-four bridges was conducted, on a contract basis, by historians Jeffrey A. Hess and Robert M. Frame III. They also compiled historical research dossiers on the various bridges from local and state archives, libraries and local residents.

CHIPPEWA RIVER BRIDGE

The Chippewa River Bridge is located about midway between the small Wisconsin communities of Nelson and Pepin. It crosses the main channel of the Chippewa River, and is one, albeit the largest, of several spans utilized as STH 35 crosses the low land and sloughs that surround the Chippewa. The construction of the bridge provided the first ever, direct, vehicular connection between the two communities.[41]

The first Euro-American settler in the Nelson area is reported to have been James Nelson, an Englishman who is thought to have arrived in the early 1840s. There was an influx of settlers into the vicinity in the 1850s, and the Town of Nelson was established in 1857.[42] Within the Town of Nelson, the Village of Nelson evolved. Reportedly settled in 1863, it had a population of 200 by 1884. This population supported at least seventeen businesses, among which were three justices of the peace, two saloons, one sawmill, one hotel, one lawyer, one constable and one physician.[43] Grain, produce and tan bark were noted as the principal items shipped from the town. The Village was platted in 1886, at which time it was noted that most of its residents were German and Norwegian, along with some Americans and Scottish. The Chicago, Burlington & Quincy Railroad also entered Nelson in 1886.[44] Nelson's population reached 250 by 1901. Among the thirteen businesses listed in the gazetteer for that year were three saloons, two general stores, two hotels, and one grain elevator, shoemaker, blacksmith and livery each.[45] The town continued to grow slowly, adding another fifty residents by 1924. There were nineteen entries in the 1924 gazetteer, among which were five that were related to agricultural pursuits (including a co-op creamery), three general stores, two garages, as well as

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[41]Vehicular transportation is emphasized here because a railroad directly connected the two towns in 1886.

[42]Houser F. Rockwell, West Central Wisconsin and Mondovi Area (Eau Claire, WI: University of Wisconsin Eau Claire, 1988), 504; L. Kessinger, History of Buffalo County, Wisconsin (Alma, WI: 1888), 648.

[43]Wisconsin State Gazetteer and Business Directory, 1884-1885 (Chicago: R.L. Polk & Co., 1884), 581.

[44]Kessinger, Buffalo County, 650.

[45]Polk's Wisconsin State Gazetteer & Business Directory, 1901-1902 (Chicago: R.L. Polk & Co., 1901), 814.

one real estate office, an insurance company, a bank, a blacksmith and a hotel.[46]

Nelson never became a major trade or agricultural support center. Its historic mission, therefore, seems to have been to serve a small geographic region by offering the basic products and services that its residents needed, for example general stores, shoemaker and so on. More emphasis on agricultural support developed as time passed, but Nelson continued to offer the community the first level of services needed by the locals. Being situated so close to Wabasha, a larger regional trade center, Nelson really never had a chance to grow into a more significant central place.

About seven miles west of Nelson is Pepin, the town near Laura Ingalls Wilder's Little House in the Big Woods. The first Euro-American settlers in the area were William Boyd Newcomb, his sister, Nancy, and their cousin, John McCain, who arrived in 1846. The following year, the four Hix brothers arrived from Illinois and settled on Roaring Creek. Many of these early pioneers found employment in the North Woods as lumberjacks. Indeed, the lumber industry was the catalyst behind Pepin's "boom period" in the early 1850s. Pepin served as a shipping port for lumber rafted down the Chippewa and Mississippi Rivers. It was also a transportation center for lumbermen heading North and for travelers riding the stagecoach between North Pepin and Chippewa Falls. Several hotels were built to accommodate the traffic along the stage line. Charles Granger built a hotel in 1852 and E. Thompson opened a hotel in 1855, the year that the village was platted as North Pepin. The prosperity continued and by the end of the decade, Pepin boasted of two banks, a newspaper, Philip Plaff's mill, a school and several stores and warehouses.[47]

This rapid growth was slowed by the financial panic in 1857 and low river levels in 1857-1858 which halted steamboat traffic. Furthermore, the Knapp-Stout Company decided to locate its warehouses in Reads Landing which became the major port on the Chippewa River. Thus, Pepin residents turned to other pursuits such as agriculture and the fishing industry. Pepin's commercial and industrial character mirrored this agricultural shift. Two grain elevators were erected and Philip Plaff built another grist mill. Around the turn of the century, Pepin had a creamery, the Pepin Pickling Company, founded in 1904 by Eugene LaFrance, and the Northern Wisconsin Manufacturing Company. Founded by the Juliots and the Schruths, this firm produced wood harrows, snow fences and a patented lever-operated steel harrow. Along with agriculture, Pepin's fishing industry provided a substantial portion of the community's income. By 1893, the

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[46]Polk's Wisconsin State Gazetteer & Business Directory, 1924-1925 (Detroit: R.L. Polk & Co., 1924, 1053.

[47]Ed C. Newcomb, "Pepin: Early History," in Pepin County History: Pepin County Wisconsin By the People of Pepin County (Dallas, TX: Taylor Publishing Company, 1985), 28-29.

fishing industry brought in $250,000 worth of business.[48]

Despite these developments, Pepin remained a small, agricultural community. Though it had once been the county seat in 1858, it lost this honor to the rapidly growing city of Durand in 1867. Even the arrival of the railroad in 1886 failed to trigger much development. Today Pepin continues to meet the needs of the local residents.[49]

For communities so close to each other, Nelson and Pepin appear to have had little contact throughout much of the nineteenth century -- a result, no doubt, of the fact that they were separated by the Chippewa River, and the additional fact that the river had to be kept clear for navigation. Since both towns are adjacent to the Mississippi, early transportation focused largely on the river. The first direct, overland transportation between the two towns became available by the mid-1880s with the arrival of the railroad. There was, however, no historic basis for a pedestrian or vehicular river crossing between the two towns. Nor was one provided when the State Highway Trunk system was created in 1918. Indeed, STH 25 proceeded northwest along the river and through Nelson, after which it turned north, along the Chippewa River, and proceeded to Durand, about sixteen miles away. Those wanting to go to Pepin could cross the Chippewa there, and then take a county road back down the river to their destination.[50] Given the inconvenience of driving over thirty miles to reach a community that was only seven miles away, pressure began to grow for the construction of a road that would finally join Nelson and Pepin. That objective was met on 11 November 1933, when the largest bridge that the Wisconsin Highway Commission had designed up to that point was officially opened. Consisting of seven high truss steel spans, each 175 feet long, the bridge extends 1,235 feet and links Pepin, Pepin County, with Nelson, Buffalo County. The Chippewa River Bridge was the main feature of the State Highway 35 Project which included the construction of 6.9 miles of new road across the river and its bottom lands and eight other bridges.[51]

The movement to build the bridge began on 6 August 1923, when the Pepin Village Council allocated $100 to stimulate interest in a bridge across the river and to urge the adoption of its portion of Highway 35 into the state highway system. Delegations from Buffalo and Pepin Counties, bearing petitions advocating those goals, attended a meeting of the joint committee of the state legislature held at the Durand Court House on 17 August 1923. Upon the joint committee's recommendation, the state legislature adopted the

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[48]Newcomb, 29; Pepin County History, 32.

[49]Newcomb, 29.

[50]1920 Official Map of the State Trunk Highway System of Wisconsin (Madison: Wisconsin Highway Commission, 1920).

[51]The Pepin Herald, 9 November 1933; Buffalo County Journal, 18 May 1933; 17, 24 August 1933.

stretch of road between Pepin and Nelson, including the proposed bridge, as a part of the State Trunk Highway System in early 1924.[52] These efforts served a two-fold purpose: 1) the condition of Highway 35 would be improved and 2) the bridge would allow direct access between Nelson and Pepin, eliminating the need to pass through Durand.

An additional stimulus for this project involved groups interested in creating a scenic highway route along the Mississippi River such as the Highway 35 Association and an organization from Dubuque, Iowa, founded by Malcolm MacKinnon and A.F. Hebe, among others. The intended purpose of these groups was to gain "nation-wide publicity [for] the attractions of the river region."[53]

Bridge planning gained momentum in 1929. At a 14 January meeting in Alma with the State Highway Commission, the important nature of the Chippewa River Bridge as a part of the State Trunk Highway System was affirmed; furthermore, the large delegation of Pepin residents attending determined that the bridge project would be the focal point of any further construction on Highway 35. In July, a meeting of several interested groups was held at the Pepin Opera House. The purpose of the meeting was to organize and devise ways of paving Highway 35 with concrete between East Dubuque, Illinois, and Superior, Wisconsin, emphasizing the need for a bridge across the Chippewa River. A resolution formally recognizing the necessity of the bridge was introduced by I. M. Newcomb, a Pepin County Board representative, on 1 November 1929. Resolution #14 required that the bridge be at least 300 feet long, not including approaches, that the State Highway Commission construct the bridge and that the counties deriving benefits from the bridge be assessed appropriately.[54]

In 1930, the State Highway Commission directed that Buffalo and Pepin Counties each be assessed $50,000 for the bridge. The law was later changed so that Pepin County had to pay $20,000 while Buffalo County was responsible for $40,000 with the understanding that the project area would include concrete paving. As plans got underway, an obstacle arose concerning the type of bridge to be built. Residents along Highway 35 wanted a solid steel bridge across the river, necessitating the closing of the Chippewa River to navigation. When the Wisconsin Highway Department asked the federal government to close the river, Durand citizens launched a protest at a meeting on 10 December 1931. The government finally decided to make provisions for navigation on the river. The bridge design had to include a lift span, as well as the machinery to lift it, "if navigation

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[52]The Pepin Herald, 9 November 1933.

[53]Ibid.; Buffalo County Journal, 9 November 1933.

[54]Buffalo County Journal, 9 November 1933.

on the river ever demanded it."[55]

Once that issue was settled, bids for the entire Highway 35 project were accepted during the summer of 1932 and were awarded on 14 September. August Schroeder of Milwaukee won the contract for the grading of the road; another Milwaukee firm, the Worden-Allen Company, was awarded the contract for the Chippewa River Bridge. Contracts for four of the other eight bridges went to Minneapolis concerns while a Superior firm won the contract for the remaining bridges.[56]

Construction was well underway by the spring of 1933. The original contract called for a 1 July 1933, completion date; however, changing water depths presented a problem to the project engineers as the bridge pilings were not set deep enough. A time extension had to be granted as the engineers corrected the problem. Once this obstacle was overcome, construction proceeded smoothly. By 18 May, two of the spans on the Buffalo County side were finished while the Eau Claire Sand and Gravel Company, on a subletted contract from August Schroeder, worked around the clock on the fill on the Pepin County side. Four of the bridge's seven spans were completed by 27 July, and on 13 August, the construction was far enough along to permit pedestrian traffic. The seventh and final span was completed by 17 August, and the concrete floor was poured by 19 October. The Millis Contracting Company of Black River Falls shaled the bridge's roadbed. A concrete surface was anticipated when the roadbed was sufficiently settled.[57]

Concrete surfacing was a controversial issue regarding the entire project area. The State Highway Commission had originally planned to use concrete paving; however, by May 1933, it decided to use shale and gravel instead. This decision infuriated the Buffalo County Board which refused to make further payments on the project unless the state adhered to its original plans. (Buffalo County had an outstanding balance of $16,000 at this point.) The controversy continued throughout the summer of 1933. In August, the Buffalo County Good Roads Club, a citizens' group, issued a protest to the State Highway Commission and threatened to take its case to the public through mass meetings in all sections along the highway. As the Buffalo County Journal reported, "they expect to muster up 100,000 in an effort to impress upon the Commission . . .that they mean business and will no longer be denied that which they feel rightfully belongs to them in the way of better roads." Perhaps because of these protestations, the State Highway Commission had specified that the project area be paved with shale, gravel and oil rather than blacktop which had been proposed earlier. This specification for a less permanent surface seemed to placate protestors for

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[55]Ibid.; Buffalo County Journal, 25 May 1933.

[56]The Pepin Herald, 9 November 1933.

[57]Ibid.; Buffalo County Journal 18 May; 27 July; 17, 24 August; 28 September; 19 October 1933.

it was seen as a prelude to concrete paving.[58]

With this controversy resolved, planning for the dedication ceremony for the Chippewa River Bridge and the Highway 35 project area began on 18 September 1933. Among the planners were editor of The Pepin Herald, John M. Axtell, chairman of the Pepin celebration committee, and Arthur Gelen, treasurer, Fred Schindler and Aleck Allen, members of the Pepin Commercial Club. The anticipated date for the ceremony was Armistice Day. The 11 November ceremony was well attended despite unfavorable weather conditions. The focal point of the dedication was a ribbon cutting ceremony midway across the bridge. Joan Schruth, the four-year-old daughter of Pepin Mayor H.C. Schruth, did the honors. After the ribbon cutting, more than a thousand cars paraded across the bridge to Pepin for the rest of the festivities. Once the crowd reached Pepin, there were a series of addresses, music from several marching bands and a dance later that evening.[59]

The elaborate nature of the dedication ceremony was duly merited for this was a significant project. At a cost of nearly $1,000,000, the bridge shortened the distance between Nelson and Pepin and served as an important stepping-stone for the improvement of Highway 35 and the creation of a scenic route along the Mississippi.[60]

PART II. ARCHITECTURAL INFORMATION

A. General Statement:

1. Architectural Character: The Chippewa River Bridge was erected in 1933. It is a good example of a multiple-span, Parker through truss.

2. Condition of fabric: The historic integrity of this bridge is largely intact, a macadam overlay on the original concrete deck being the only apparent alteration. The structural integrity of the bridge's individual components, however, is deteriorating. The bearings, floor beams and deck stringers are in poor condition, as are the expansion joints and the concrete deck. As well, members of the sway bracing have been damaged by high vehicles. Given these problems, the bridge's sufficiency rating is 29.5. Replacement of the structure is being planned.

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[58]Buffalo County Journal, 25 May; 10 August 1933.

[59]The Pepin Herald, 9, 16 November 1933; Buffalo County Journal, 9, 16 November 1933.

[60]Buffalo County Journal, 9 November 1933.

B. Description:

The Chippewa River Bridge is a seven-span Parker truss bridge. Built in 1933, it is 1,235'-0"long and carries a 24'-0" wide traffic deck. Spans 1 and 7 are 175'-0" long, while spans 2, 3, 4, 5 and 6 are 177'-0" each. The height of the structure varies from 24'-0" at the portal struts to 33'-0" at the center of each span.[61]

The bridge rests upon two concrete abutments and six piers. All but the center two piers are anchored on forty-six piles and are built on 47'-8" x 8'-0" x 3'-0" bases. They rise 18'-6" from their foundations, and taper from 45'-0" x 6'-0" at the base to 35'-8" x 4'-6" at the top. Because they were designed to support a lift span, the center two piers are more substantial. They are anchored on fifty-seven piles and are built on 54'-0" x 9'-6" x 3'-0" foundations. They, too rise 18'-6" from their bases, although they taper from 51'-2" x 7'-6" inches at the foundation to 41'-10" x 6'-0" at the top.

The deck is carried by eleven floor beams per span, each of which is a 33-1/4" x 11-1/2" "I" beam. Perpendicular to the floor beams are eight deck stringers. Each stringer is a 16-1/4" x 7-1/2" "I" beam. The bottom lateral bracing is comprised of 4" x 3-1/4" angles. The deck itself is concrete with a macadam overlay.

The floor beams, with the exception of the first and eleventh in each span (they sit upon the abutment or piers), are hung from 9-3/4" x 8", "I" beam hip verticals and either 10" x 10" or 12" by 10" intermediate verticals fabricated from channels and angles. The inclined end posts, as well as the top chords, are 18" x 12". Each is two channels, connected with lacing and coverplates. Top lateral bracing is comprised of angles and lacing. Portal struts and portal bracing are fabricated from two, 2-1/2" x 3" angles and lacing. The top struts are built from double, back-to-back 2-1/2" x 3" angles with lacing, while the lower chord of the sway bracing consists of double, back-to-back 3" x 4-1/2" angles and lacing. 4" x 3" inch angle cross lacing complete the sway bracing.

The diagonals in panels 2 and 9 are 8" x 10" "I" beams, while those in panels 3 and 8 are 6" x 10" "I" beams. Those in panels 4, 5, 6 and 7 are also 10" "I" beams. Bottom chords are paired, 12" channels connected with regularly placed tie plates.

All major joint connections are riveted.

An 8" channel traffic guard just above the curb, with a railing built of 2-1/2" x 3" angles and 1-1/2" x 1/4" lacing above it, are on each side of the bridge.

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[61]All data in this description was garnered from the bridge plans, copies of which are in the possession of Westbrook Associated Engineers, as well as a bridge inspection on 6 August 1993.

C. Setting:

This bridge is located approximately half way between Nelson and Pepin, at that point where STH 35 crosses the Chippewa River. Generally oriented on a northwest/southeast axis, the bridge is in the river's bottom lands. There is no development in the area. Indeed, much of the road approaching the bridge was built on fill.

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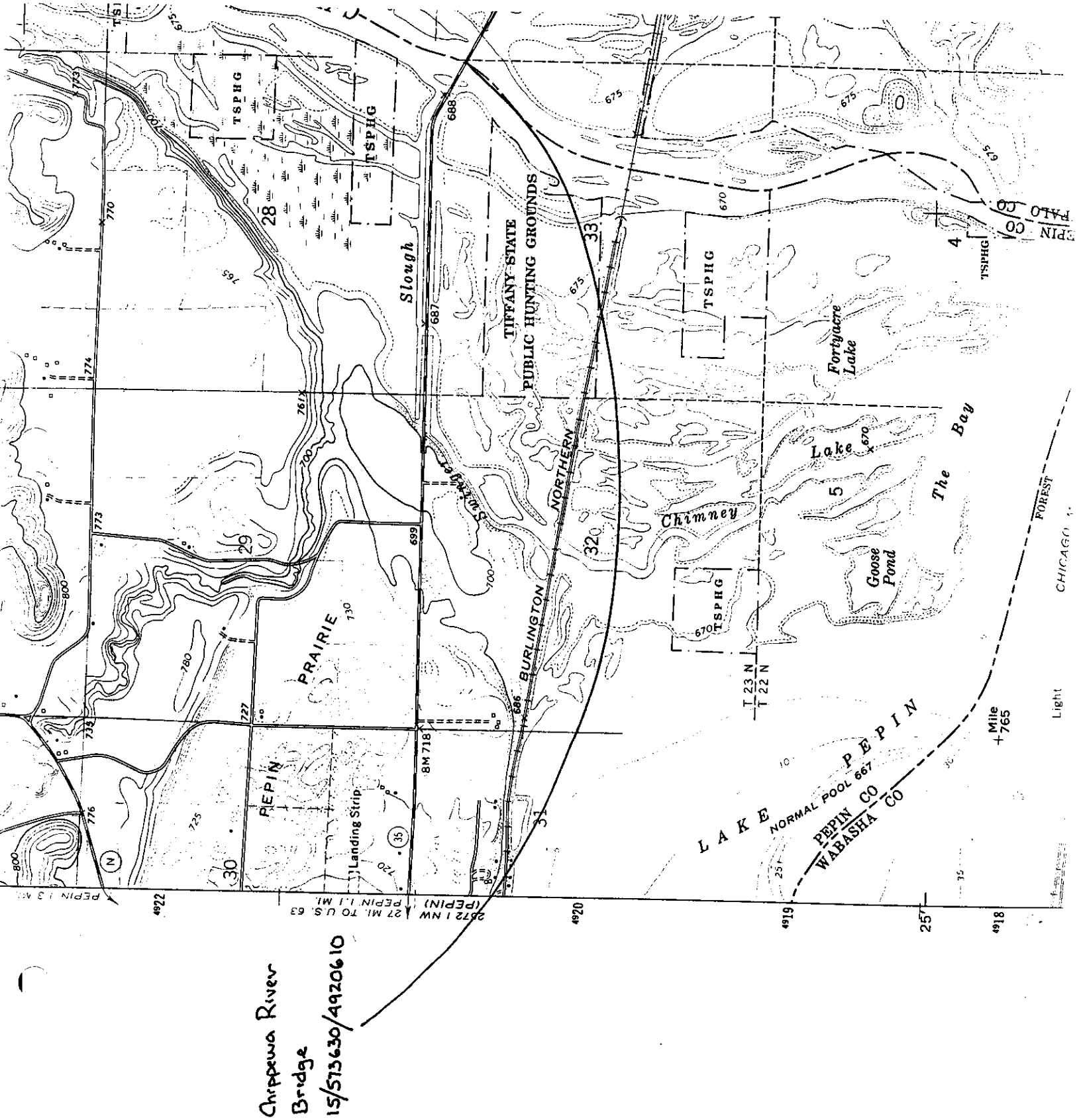
PART IV. PROJECT INFORMATION

This project has been sponsored by the Wisconsin Department of Transportation.

Westbrook Associated Engineers, Spring Green and Appleton, Wisconsin, formally acted as the contracting agency. The project was undertaken by Dr. John N. Vogel, Principal Investigator and Historian for Heritage Research, Ltd., who provided all exterior photographs and the architectural/technical data. He also edited and prepared the final document. Messrs. Jeffrey Hess, Robert Frame and Robert Newbery prepared all the truss bridge background material, while Ms. Laura Abing and Mr. Kevin Abing, Heritage Research Assistant Historians, prepared the local contexts and the Chippewa River Bridge History itself. The photographic copies of the bridge plans, as well as all the archival processing and printing, were completed by Mr. Wayne Chandler, Mayfair Photography, Wauwatosa, Wisconsin.



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